

R. Michael Turnipseed, Director

ALLEN BIAGGI, Administrator

(775) 687-4670
TDD 687-4678

Administration
Water Pollution Control
Facsimile 687-5856
Mining Regulations & Reclamation
Facsimile 684-5259

State of Nevada
KENNY C. GUINN
Governor



Waste Management
Corrective Actions
Federal Facilities

Air Quality
Water Quality Planning

Facsimile 687-6396

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL PROTECTION

333 W. Nye Lane, Room 138
Carson City, Nevada 89706

October 29, 2003

Mr. Dave McCarthy
Atlantic Richfield Company
317 Anaconda Road
Butte Montana 59701

SUBJECT: Final Draft Groundwater Conditions Work Plan, Yerington Mine Site

Dear Mr. McCarthy:

The Nevada Division of Environmental Protection (NDEP) has received and evaluated the Final Draft Groundwater Conditions Work Plan, dated February 25, 2003, regarding the continued environmental investigation of the Yerington Mine, located in Lyon County near Yerington Nevada. This office provides the following comments from NDEP, EPA, BLM, U.S. Fish and Wildlife and other technical representatives of the Yerington Technical Work Group (YTWG).

NDEP General Comments

The Groundwater Conditions and other site investigation work plans at the Yerington Mine are required by the regulatory agencies for the purpose of evaluating potential sources of contaminants of concern; to determine if contaminants above state action levels have been released to the environment; to determine the potential for migration of contaminants; to determine the potential for exposure and exposure pathways; and to determine appropriate corrective action strategies, if necessary.

Response to Comment: Atlantic Richfield acknowledges that site investigations at the Yerington Mine are required by the regulatory agencies for the reasons stated in this comment. The Draft Groundwater Conditions Work Plan defines the area of mine-related groundwater that represents releases of a number of constituents of concern (COCs) to the shallow alluvial aquifer. The Draft Work Plan also presents existing empirical data and hydrogeological concepts, subject to hypothesis testing by the proposed site investigations, that indicate that COCs have not migrated from the mine site and that the defined area of mine-related groundwater has remained relatively "static" for the past 16 years (since 1986 when pumpback operations were initiated). Atlantic Richfield strongly believes that the proposed field investigations described in the Draft Work Plan will provide NDEP with the data necessary to determine

potential migration and exposure pathways, and to evaluate appropriate corrective action strategies, as necessary.

NDEP does not concur that the field investigations described in the draft work plan will provide the data necessary to determine potential migration pathways and to evaluate appropriate corrective action strategies as necessary. Contaminant transport evaluation requires understanding provided by calculations and literature estimation methods regarding groundwater flow direction and gradient, seepage velocity, hydraulic conductivity, advection dispersion, adsorption, absorption and retardation as well as other factors. No aquifer tests or estimation methods have been proposed to evaluate the required flow parameters and the other compound specific transport parameters have not been discussed. If this information is already available, it must be included in the work plan to justify omission of further field work. Failure to provide this information will result in continued misunderstanding and conflict regarding the existing and future conditions of the groundwater beneath and down gradient of the mine and will continue to delay the appropriate corrective action.

Groundwater impacts due to individual potential source areas and groundwater flow and contaminant transport at the mine boundaries will not be adequately characterized by the conduct of this work plan. Evaluation of specific source areas for the purpose of eliminating them from further characterization must be comprehensive and defensible. Understanding of impacts at the mine boundaries is essential for determining appropriate corrective action.

Response to Comment: Based on available groundwater quality data, Atlantic Richfield delineated the area of mine-related groundwater (i.e., area of potential mine-related impacts) in the Draft Work Plan. This area is generally located beneath the northern portion of the mine site, and appears to have limited extent beyond the northern margin of the site. As discussed in the Draft Work Plan, the extent of this area has been static for the past 16 years.

There are a number of mine units and sub-units (e.g., ponds, tailings, conveyance features, process areas) that may have contributed to the observed groundwater quality in this defined area. Recognizing that groundwater quality in this area has been affected by past mining practices, and is represented by the water quality data presented in the Work Plan for monitor wells in this area, Atlantic Richfield does not believe that source-specific groundwater investigations are warranted and were not included as an objective of the investigations. This position is based on:

- *Groundwater flow in the shallow alluvial aquifer is “constrained” at the northern margin of the site by natural hydrogeologic conditions from pre-mining to the present, recharge conditions dominated by the agricultural area at the northern margin of the site, limited recharge from other areas, and the operation of the pumpback well system;*
- *The strong likelihood that it would not be possible to identify or individually characterize the contribution of COCs from specific mine units or areas within the site. NDEP does not concur with this statement. Source area characterization is conducted on large site investigations on a regular basis. In addition, source-specific investigations will not provide any more information about groundwater conditions beneath the mine site than is already known in the context of assessing human health or ecological risk, or how best to close the site; NDEP does not concur. If you willing to assume a mine unit is contributing to adverse groundwater impacts and are willing to mitigate this pathway through capping or some other reasonable corrective action, then you may be correct. However, you have stated that you are not willing to assume “worst case”. and*
- *The extent of surface mine unit investigations proposed in the Draft Groundwater Conditions Work Plan (soil moisture monitoring) and in companion Work Plans (Tailings Areas and Evaporation Ponds, Waste Rock, Arimetco Heap Leach and Process Components, and Process Areas Work Plans) that will demonstrate the potential of these mine units to source COCs to*

groundwater, provide adequate data for the evaluation of human health and ecological risk, and provide a basis for appropriate closure activities.

Atlantic Richfield agrees that an understanding of impacts at the mine boundaries is essential for determining appropriate corrective action, and developed the Draft Work Plan to focus groundwater investigations on those areas.

NDEP is concerned that characterization of groundwater flow and contaminant transport at the mine boundaries and individual mine unit source areas will remain inadequate following the completion of the proposed field work described in the work plan. Information must be collected that will support any decisions that address the potential for exposure and contaminant fate and transport. The appropriateness of any required corrective action cannot be accomplished without this required assessment. Public health, environmental and economic impacts warrant proper detection, delineation, and fate and transport procedures and analysis. Failure to provide this information will delay the development of any remediation plans resulting in additional adverse impacts to the community and adjacent properties, to include increased project costs.

Response to Comment: It is Atlantic Richfield's desire to provide NDEP with the information necessary to reach site closure, in accordance with the Closure Scope of Work. As described in our responses to the above portions of NDEP's General Comments, Atlantic Richfield asserts that source-specific groundwater characterization efforts will not yield additional useful information regarding human health or ecological risk, or how best to evaluate site closure options. Proposed monitoring and data collection activities are directed at establishing a thorough understanding of the delineation, fate and transport of mine-related groundwater. NDEP does not concur with this response to comment. See other comments to your responses that address these same issues.

Atlantic Richfield does not understand NDEP's concern given the extent of new monitoring that focuses on boundary conditions related to the area of mine-related groundwater at the site, and the acquisition of data to determine background water quality conditions, as proposed in the Draft Work Plan. The proposed monitoring network and data collection activities will enable Atlantic Richfield and NDEP to:

- *Evaluate the effectiveness of the existing pumpback system; NDEP does not concur that your proposed groundwater characterization will be adequate to evaluate the pumpback system effectiveness.*
- *Determine the effects of agricultural pumping and irrigation applications on alluvial groundwater flow: It is unclear how you will evaluate the effects of agricultural pumping without performing pumping calculations or modeling of the groundwater.*
- *Delineate the extent of the area of mine-related groundwater; NDEP does not concur that your proposed investigation will provide adequate down gradient data points to allow construction of defensible isoconcentration contour maps.*
- *Evaluate background water quality;*
- *Improve the preliminary site water balance and assessment of groundwater flow beyond the northern margin of the site; and*
- *Assess closure alternatives and related groundwater management.*

However, if Atlantic Richfield Company is prepared to propose reclamation/remediation solutions, that are protective of the environment, public health and assume "worst case" source area and mine boundary contamination, an incomplete characterization at potential source areas may be justified and may be in

the best interest of all parties concerned. This approach has potential to resolve difficult environmental concerns in a timely and economically advantageous manner, will minimize any further contaminant impacts on and off site, will minimize the magnitude and liability of these impacts and is encouraged. Further, defensible corrective action will provide economic enhancement of impacted properties. Otherwise, a more comprehensive approach will be required. If Atlantic Richfield is interested in this concept, you should propose alternative defensible rationale to the Yerington Technical Work Group. Adaptation of this philosophy could eliminate some of the specific comments described below.

Response to Comment: Atlantic Richfield appreciates, and shares NDEP's interest in resolving Yerington Mine site environmental issues in a timely and cost-effective manner. We are open to discussing specific NDEP requests for additional data thought to be necessary to reach the stated site investigation methods. Atlantic Richfield intends to work with NDEP to achieve this objective, and believe that implementation of the Groundwater Conditions Work Plan and companion Work Plans will provide a technically defensible basis for site closure. However, Atlantic Richfield does not believe it is necessary to assume "worst case source area and mine boundary contamination" as suggested in this comment. Our approach is to use the empirical groundwater data that will be collected as part of proposed site investigation activities to document the boundary conditions without assumptions. If Atlantic Richfield is not interested in this concept, complete, defensible characterization of ALL potential source areas is warranted and required. NDEP remains concerned that your proposed approach will not resolve difficult environmental concerns in a timely and economically advantageous manner, will not minimize further contaminant impacts on and off site, and will not minimize the magnitude and liability of these impacts.

Atlantic Richfield is also interested in providing NDEP with empirical groundwater monitoring data that will support the data quality objectives (DQOs) described in the Draft Work Plan, and that will be sufficient to develop site closure and water management alternatives. Based on our current understanding of site groundwater conditions and the conceptual hydrogeologic model presented in the Draft Work Plan, we are confident that the proposed field investigations will effectively support site closure. Atlantic Richfield would like to discuss the basis for timely and cost-effective closure with NDEP, at a mutually convenient time in the near future.

However, Atlantic Richfield Company is encouraged to propose interim actions, with an appropriate amount of interim characterization, that address and improve or correct potential problems and impacts to the environment and human health. Those proposals will be considered and, if warranted, may be implemented before a final characterization work plan is developed and implemented. Implementation of interim actions may be justified and may be in the best interest of all parties concerned. Such actions may resolve immediate environmental concerns and will be considered in the context of the site as a whole when remedies are selected and site conditions are fully understood. Interim actions include traditional engineering controls such as diversion and containment activities, which typically focus on controlling exposures and the migration of a release. Examples of traditional engineering controls that address impacts on and off-site may include the capping of fugitive dust followed by air monitoring to evaluate the effectiveness of the cap, and improving the efficiency and effectiveness of the pump-back system. As long as interim containment measures are maintained, stabilized facilities commonly do not present unacceptable short-term risks to human health or the environment. This approach would allow Atlantic Richfield and the YTWG the opportunity to shift their resources to health or environmental concerns elsewhere on the site as appropriate, to expedite final site cleanup. If Atlantic Richfield is interested in proposing and implementing interim actions, please propose those actions to the regulatory agencies. *Please Note: The above paragraph is provided to Atlantic Richfield to replace the original paragraph towards which you have directed your comments immediately above. The Agencies did not concur on the content of the original paragraph but have agreed on this language.*

NDEP Specific Comments

Page 3

There is no mention of the acid plant facilities or the Anaconda dump leach. These are both significant mine units and should be noted.

Response to Comment: The attached Draft Final Work Plan includes these references.

Last paragraph: The sentence on the lined evaporation ponds is confusing. It should be moved to the end or noted that Atlantic Richfield constructed these ponds. A reader who did not know the property would think that Arimetco built these ponds.

Response to Comment: The attached Draft Final Work Plan has been modified to reflect this comment.
Response Acceptable.

Arimetco ceased mining new ore and adding acid and makeup water to the heaps in November 1998 not 1996. Arimetco continued to recover copper from heap drain down fluids until November 1999. The NDEP took over fluid management of the Arimetco Facilities in January 2000.

Response to Comment: The attached Draft Final Work Plan incorporates the information presented in this comment. Response Acceptable.

Page 4

The Anaconda W3 dump leach should be listed here

Response to Comment: The attached Draft Final Work Plan includes this edit. Response Acceptable.

Section 1.3.8

Should the Anaconda process area wells be noted in this section? Wells WW-10 and MW-01 both show elevated selenium levels. What is the groundwater flow direction in the Anaconda process area? Selenium was a by-product in the acid plant at least during a portion of the 1950's. Records at the mine office show that small quantities were sold up until 1958 as precipitator mist mud.

Response to Comment: Selenium was noted as a potential COC on page 23 of the Draft Work Plan. The groundwater flow direction in the Anaconda process area is to the northwest.

No monitoring wells exist in the vicinity of the Arimetco Plant site. Additional wells down gradient of this area are warranted to evaluate this potential source area.

Response to Comment: Please see response to NDEP General Comment.

Page 15

"Data are not available to characterize groundwater flow conditions in the deeper portions of the alluvial aquifer." Is Atlantic Richfield going to provide sufficient data by executing this groundwater conditions work plan?

Response to Comment: As presented in the Draft Work Plan, Seitz et. al. (1982) concluded that flow directions in the deeper aquifer presumably resumed a more northerly flow direction after the cessation of

industrial pumping. However, seasonal agricultural pumping immediately north of the mine site likely affects groundwater flow in the deeper alluvial aquifer. Atlantic Richfield intends to characterize groundwater flow conditions in the deeper portions of the alluvial aquifer in the area north of the mine site through the installation of nested monitor wells and piezometers. The monitoring proposed in this area is focused on evaluating the potential migration of COCs from the site at depth, the potential for vertical gradients, and the effects of agricultural groundwater pumping and applications on the deeper alluvial groundwater flow system. Response Acceptable.

Page 30

Quarterly monitoring activities for one year will likely be inadequate to effectively evaluate groundwater conditions. Based on analytical results during the first year, future requirements will be determined.

Response to Comment: As presented in the Draft Work Plan, Atlantic Richfield intends to monitor groundwater conditions at the mine site for one year and present these results in a Data Summary Report. In addition, the Data Summary Report will include current data being collected under separate NDEP order. The Data Summary Report will be particularly useful in further understanding groundwater flow conditions at the site. Atlantic Richfield agrees that additional groundwater monitoring may be required, during and after the implementation of site closure activities, pending our analysis of the collected data. However, Atlantic Richfield does not intend to unnecessarily extend the length of site investigations. Response Acceptable.

Page 46

First Bullet: The evaluation of the influence of irrigation pumping is essential for the understanding of groundwater flow in the vicinity of the mine. How will these influences be evaluated?

Response to Comment: Atlantic Richfield proposes to collect well pumping and surface water application rates, if available, from the agricultural area located immediately north of the mine site. In addition, proposed monitoring of shallow and deep groundwater elevations in this area will provide information on the influence of irrigation pumping on the groundwater flow system.

What will be done with this information? How are calculations to be performed to evaluate this data? NDEP remains concerned that it will be difficult if not impossible to understand three-dimensional groundwater flow and contaminant transport without these calculations. Please clarify.

Second Bullet: Please include specific (AHA, 1999) pumping test data, procedures and wells tested.

Response to Comment: The attached Draft Final Work Plan includes the available information requested in this comment, added to Appendix A. Response Acceptable.

Page 48

"Presently, no information is currently available on the pumping rates of agricultural supply wells from deeper portions of the aquifer that may affect the shallow alluvial aquifer." How will this and other information regarding affects of pumping be determined?

Response to Comment: Agricultural supply well pumping data will be used in conjunction with other monitoring data to improve our understanding of site water balance conditions and the effect of these wells on groundwater flow in the deeper alluvial aquifer. The potential for vertical flow is conceptualized to be an important groundwater flow condition at the site, which will be addressed by proposed monitoring. Response Acceptable.

Bottom of page 49

Selenium should be added as exceeding the primary MCL in WW-10 and MW-01.

Response to Comment: As mentioned above in response to comment on Section 1.3.8, page 23 of the Draft Work Plan noted selenium as a potential COC. The selenium value of 0.27 mg/L in monitor well WW-10 from the June 2002 sampling event was higher than the primary MCL of 0.05 mg/L. The selenium concentration in MW-01 from this sampling event was 0.024, less than the MCL. This information has been added to page 49 of the attached Draft Final Work Plan. Response Acceptable.

Page 51 (3.1 Site Investigations)

Evaluation of the affects of pumping should be included as a site investigation activity in this Groundwater Conditions Work Plan.

Response to Comment: An evaluation of the effects of agricultural pumping and the pumpback well system was included in the site investigations proposed in the Draft Work Plan. Please clarify additional well pumping evaluations that NDEP would want to see proposed in the Final Work Plan. See earlier comments regarding standard parameters that must be evaluated. It remains unclear how you will evaluate the effects of agricultural and other pumping without performing numerical groundwater modeling calculations.

Page 53

Please justify screen intervals that are “five feet below the water table”. This technique is not standard procedure and will not be adequate to evaluate some of the potential chemicals of concern including hydrocarbons.

Response to Comment: The attached Draft Final Work Plan will clarify the proposed screen construction. The proposed five-to-ten foot screen interval will nominally be placed within the upper ten-to-fifteen feet of saturated alluvium, starting immediately below the water table. This construction will enable the upper portion of the aquifer to be discretely monitored for potential impacts resulting from surface mine units at the site, which provides the most conservative approach to groundwater monitoring, and will allow for groundwater elevation fluctuations due to climatic and/or cultural effects (i.e., reduced elevations due to drought conditions). Atlantic Richfield believes it will be suitable to evaluate potential COCs, including hydrocarbons, but will discuss other monitor well construction techniques to achieve the DQOs stated in the Draft Work Plan.

NDEP remains concerned with this approach. The fact that Atlantic Richfield believes that this approach is suitable to evaluate potential COCs, including hydrocarbons is disturbing. The placement of the screened interval below the groundwater surface is not standard practice. Please explain how this approach will detect volatile organics or other compounds with densities less than water and concentrations less than their respective solubility. Please provide guidance from the literature that justifies this approach or revise your plan to include standard monitoring well screening construction techniques that comply with acceptable ASTM standards. This office has been unable to locate this information in the literature.

Page 54 Groundwater Quality Sampling and Analyses

Monitoring Wells WW-08 and WW-23 should be included in the current quarterly sampling program. This additional information would be helpful in the short term and may help in determining the location of any future additional monitoring wells.

Response to Comment: Monitor well WW-08 is no longer in service due to an obstruction at 25 feet below ground surface. WW-23 has been excluded because of its close proximity to WW-10 and MW-01, and would not provide additional useful data. NDEP has evaluated the “close proximity” of the wells and found them to be approximately 800 feet apart. NDEP requires that WW-08 and WW-23 be included in the sampling program.

Page 55

Please provide equipment specifications for the “real-time kinematic global-positioning satellite (GPS) device.

Response to Comment: The Draft Work Plan specified an accuracy of 0.01 feet for latitude, longitude and elevation, adequate for the proposed surveying. As other specifications for individual surveying instruments may vary, and the surveying sub-contractor has not yet been selected, this information can be presented in the Data Summary Report, as required. Response Acceptable.

Figure 12B and 13B

Iron and Sulfate levels should be included for MW-02 and MW-05 on the contour maps. It seems that there is a lack of data towards the west and south to close these contours. Sample data for well WW-08 would assist in evaluating this area and should be included.

Response to Comment: The contour maps presented in the Draft Work Plan were reproduced from Piedmont Engineering (2001). These maps were not modified for inclusion in the Work Plan because they represented previous assessments of groundwater conditions at the site. Given that the Draft Work Plan included MW-02 and MW-05 as proposed monitoring locations, the Data Summary Report will present an updated figure for iron and sulfate contours that will include analytical results from MW-02 and MW-05 and the new monitor wells proposed in the Draft Work Plan. Response Acceptable.

Figures 8A and 8B

It would be helpful to differentiate between the inactive and inaccessible wells. Many wells on the southern half listed (inactive/inaccessible) are accessible and the opposite is true for a lot of the wells noted on the northern end of the property. This would help in determining if any additional wells were to be added to the sampling list in the future.

Response to Comment: Revised Figures 8A and 8B in the attached Draft Final Work Plan include the information requested in this comment. Response Acceptable.

Figure 14

Why aren't wells MW-01 and WW-10 included in the area of mine-related groundwater?

Response to Comment: These wells were not included in the area of mine-related groundwater because the 2002 groundwater quality data presented in the Draft Work Plan indicated they have neutral pH values and relatively low concentrations of metals, sulfate and total dissolved solids that may be indicative of background groundwater conditions at the mine site.

Figure 19

Additional monitor well locations for consideration:

- 1.) Between wells WW-10 and WW-59.
- 2.) Both east and west of WW-10.
- 3.) The area immediately down gradient of the Arimetco process facility.
- 4.) How will the Arimetco pond areas be examined to determine possible ground water impacts? These ponds may be in operation for several years or more. If a pond is currently impacting the site, repairs or design changes may be necessary. There have been concerns in the past regarding the Mega and VLT ponds. Repairs were made to the VLT pond by the NDEP in April 2000. Are the water quality improvements in the June 2002 sampling in MW-05 compared to the last sampling in 1999 significant? There was a noticeable improvement in almost all of the constituents except for iron, which increased by more than 100%.

Response to Comment: Atlantic Richfield has reviewed these additional monitor well locations suggested by NDEP, and do not believe they are required to achieve the DQOs presented in the Work Plan because they would all be located up-gradient of the area of mine-related groundwater. Given that the groundwater flow direction from these suggested locations would be towards the area of mine-related groundwater, and towards the pumpback well system, these well locations would only serve to address source-specific groundwater conditions at the site.

As Stated previously, unless Atlantic Richfield is prepared to assume "worst case" groundwater impacts, a complete and defensible characterization of all potential source areas is required. You have indicated you are unwilling to make this assumption. Accordingly, all potential source areas must be comprehensively characterized. Several additional wells to evaluate potential source areas are warranted and thus required.

As described in the response to NDEP's General Comments, above, Atlantic Richfield does not believe that source-specific groundwater investigations are warranted because the results of these investigations will not provide any more information about this area than is already known. In other words, source-specific characterization will not add value to an assessment of human health or ecological risk related to groundwater beneath the site, or how best to close the site). NDEP does not concur. See comment above.

It is too soon to say whether the groundwater quality exhibited by MW-05 has significantly improved. That question would be better answered following implementation of the Groundwater Conditions Work Plan.

EPA General Comments

As requested, EPA has reviewed the Atlantic Richfield Company's responses to the EPA's comments on the "Draft Groundwater Conditions Work Plan" for the Yerington Mine site located in Yerington, Nevada. EPA's original comments on the draft work plan (dated 18 December 2002) were incorporated into your review memorandum (dated 23 December 2002) that was transmitted to the Nevada Department of Environmental Protection (NDEP). These comments were then integrated into a regulatory agency review memorandum drafted by the NDEP (dated 27 January 2003). Atlantic Richfield's responses to the comments from the regulatory agencies were provided in a memorandum included with the "Final Draft Groundwater Conditions Work Plan" document prepared by Brown and Caldwell (dated 25 February 2003).

EPA still has several major concerns with the revised work plan. First, the work plan appears to have been designed in order to support a specific conceptual site model rather than address site characterization needs in order to refine the conceptual model. EPA believes that we all agree that more data are necessary to accurately depict ground-water flow patterns at the site. However, EPA is still concerned about the spatial distribution of boreholes and monitoring wells, existing and proposed, and whether this drilling/monitoring program will be sufficient for determining lateral and vertical movement of ground water and the presence and lateral continuity of potential aquitards. Second, the revised work plan provides limited information on the methods that will be used for the proposed activities. Not only is the discussion of field methods limited, but proposed methods of data interpretation also are vague. For example, geochemical investigations proposed in the work plan are limited and the plan does not describe any approach for understanding water-rock interactions at the site (such as geochemical modeling). At some point in time Atlantic Richfield will need to present this information to the Yerington Technical Work Group. It would be preferred if proposed methods were provided in the work plan. Third, efforts to better characterize the threat of contamination (such as determining the water quality beneath source areas, the extent of contamination, and the potential fate of COCs) are limited. The COC plume(s) need to be delineated and contaminant migration pathways (both laterally and vertically) need to be verified. COC concentrations throughout the plume must be characterized (from the source area to the distal edges of the plume) and important water-rock interactions responsible for the fate of the COCs must be understood. Without a thorough analysis of the geochemical evolution of the ground water at the Yerington Mine site it will be difficult to evaluate potential human health and ecological risks and to identify the most appropriate and cost effective remedial strategies for addressing ground-water contamination.

Below EPA has commented briefly on Atlantic Richfield's responses to the comments that EPA forwarded in an earlier review memorandum. To assist you in sorting through these comments, we have followed the numbering format used in Atlantic Richfield's letter dated 25 February 2003.

EPA Comments on Atlantic Richfield's Response Letter:

1. As indicated in the above general comments understanding the geochemical evolution of ground water at the site will play an important role in evaluating COC fate and transport and identifying and selecting remedial alternatives. Some knowledge of the chemical composition of the residual solutions would help to define one endpoint in the evolution history of site waters.
2. EPA feels that the Tailings Areas and Evaporation Ponds Work Plans should be checked to verify that the impact of conveyance ditches on the movement and release of residual solutions will be evaluated.
3. Legends/keys on the maps and figures should be provided to help reviewers interpret the information presented in the document.
4. What evidence will be used to support the conclusion that horizontal hydraulic conductivities are two orders of magnitude greater than vertical conductivities? What methods will be used to evaluate hydraulic conductivity? How many locations will be tested to provide a reliable estimate of hydraulic conductivities across the site (and their inherent variability)? At how many locations will the physical characteristics and hydraulic properties of potential aquitards be evaluated?
5. Where in "Section 3.0 - Work Plan" is the analysis of the pumpback system capture zone discussed? The installation of two piezometers in the vicinity of the pumpback wells is briefly mentioned in Table 6, but other than that I could not find any discussion of capture zone analysis. How many non-pumping well observation points will be used to supplement these two new data points? Will this be sufficient to interpret lateral and vertical capture by the system?
6. More water level data are needed (spatial and temporal) to evaluate ground-water flow patterns and the seasonal variability in flow directions at the site.
7. The presence of finer stratigraphic units in the subsurface has been proposed based on the evaluation of cuttings during previous monitoring well construction activities. However, evidence supporting the hypothesis that these units can be classified as aquitards and that they are laterally continuous has not been presented. As for using water quality data to determine if contamination is present in the "intermediate" and "deep" aquifers, hydraulic head data for these units are limited and insufficient for determining ground-water flow directions. This calls into question whether the intermediate and deep monitoring wells would show any effects from past mining operations.
8. Atlantic Richfield has indicated that current agricultural pumping and irrigation rates will be obtained as part of the proposed investigations.
9. Figure 13A has been corrected.
10. Atlantic Richfield proposes collecting only water level data from the Walker River, West Campbell Ditch, and Wabuska Drain. While these data will provide additional data for constructing maps of the water table surface, additional data on flows and water quality also should be collected. Determining discharges at different points in these surface water bodies will support whether these conveyances exhibit gaining or losing conditions (that is whether they are receiving water from or losing water to the shallow aquifer). Because ground water flowing under the site is diluted by these surface waters and irrigation water, water quality data will aid in the interpretation of the geochemical evolution of site ground water.

11. Site-wide water quality data have not been collected on a regular basis. Although there is a large volume of historical water quality data, previous water quality sampling events have been sporadic in both a spatial and temporal sense. To date, this historical water quality database has not been used effectively to help the Yerington Technical Work Group conceptualize ground water quality or movement at the Yerington site. Because these data have not been presented in a satisfactory manner, their usefulness is unclear at the moment. Designing a long-term monitoring plan in order to better understand temporal and spatial changes in water quality is a good idea. However, collecting samples quarterly for only one year will not provide enough data for reliable interpretations.
12. The questions here are how likely are deviations in local water budget components compared to the regional values reported by Huxel (1969) and how large might these deviations be? Do any potential deviations create a degree of uncertainty in the budget that justifies collecting site-specific data?
13. Granted the hydraulic conductivity contrast between the alluvial aquifer and the underlying bedrock is such that ground-water flow along their contact is significant. But fractured and faulted zones in the bedrock also may be important conduits for ground-water flow and these zones could discharge to the overlying alluvial aquifer. EPA wants to make sure that a potential source in the water budget is not dismissed without the proper justification.
14. Proposed water level data and water quality results will help determine if the identified area northwest of the site is a ground-water discharge zone, if there are a sufficient number of monitoring wells in the vicinity.
15. Because there are no data available to assess the size of recharge areas that may have formed during the ponding of process waters in evaporation and tailings ponds during mine operations, the work plan should state that "localized recharge areas" may have been created (deleting the qualifier "very small").
16. The scenario suggested by Atlantic Richfield is reasonable, but hydraulic head data from different geologic units beneath the evaporation and pumpback well areas, as well as in the subsurface beneath other potential source areas, would help support this claim.
17. Parts 1-6 of this comment were not addressed in the Atlantic Richfield response letter. EPA is still unclear about the ground-water underflow component of the balance (part 7 of this comment) and has not seen the historical water quality data presented in a format that suggests COC plumes have been static for 16 years.
18. To accurately characterize the source zones and their contribution to ground-water contamination, as well as to identify and select appropriate remedial alternatives, ground-water quality samples will need to be collected underneath these areas.
19. As discussed in Comment No. 18 above, discharge and water quality data also should be collected for the Walker River, West Campbell Ditch, and Wabuska Drain.
20. Will direct-push technologies be used in the future as part of the ground-water conditions investigations?
21. At some point in time the proposed methods for drilling and installing monitoring wells and piezometers will have to be presented to the Technical Work Group.

22. Again, where in “Section 3.0 - Work Plan” is the analysis of the pumpback system capture zone discussed? EPA could not find any discussion of capture zone analysis under the discussion of the work plan.
23. One monitoring well cluster located north of the site is not sufficient to characterize water quality in the “intermediate” and “deep” aquifers. Additional monitoring wells and water quality samples will be needed to adequately characterize water chemistry in these units and evaluate spatial variability of water chemistry. Also, there is no mention of collecting background water quality samples from these aquifers for comparative purposes.
24. At some point in time the proposed approach for evaluating soil moisture measurements will have to be presented in detail to the Technical Work Group.
25. Soil moisture sampling/measurement locations should be located adjacent to ground-water monitoring wells to ascertain the potential impact of infiltration on the shallow ground water. If shallow monitoring wells are not present in these areas, they should be constructed. Soil moisture samples should be analyzed for chemical constituents and the results should be compared to ground water quality findings.
26. See Comment No. 19.
27. EPA feels that it will be critical that the various work plans are integrated as best possible to provide an efficient and economical course of action. Findings from field investigations and data analyses proposed under other work plans can also be used to support findings generated by the groundwater conditions work plan and vice versa.

BLM General Comments

The uncoordinated groundwater characterization strategies of the various work plans renders the groundwater pathway of several mine units inadequately characterized, and therefore, unable to contribute to the risk assessment or the selection of remedial actions (closure alternatives). Furthermore, to adequately assess groundwater conditions at the Yerington Mine, additional monitoring wells beyond those being proposed in the Plan are necessary. Additional monitoring well installations are necessary and justified for many reasons, such as due to the lack of coordination between the DQOs of this plan and companion plans, the mere expanse of the site (over three miles), the uncertainties of the site conceptual model (hypotheses testing), the uncertainties of ground water flow directions, and the need to physically abandon and replace some existing monitoring wells that are proposed for continued use.

Justification for the selection of the Constituents of Concern (COCs) must be provided in this work plan. Moreover, this COC list should be based upon historical knowledge of this site and how large mining operations such as this operated. Potential groundwater impact sources and parameters being ignored in this draft plan include the unknown mining practices and processes that occurred on over 7-acres of concrete pads and building foundations, the known use and existence of PCBs, the confirmed presence of flammable liquid containers and the likelihood of machine repair shops and fuel depots. In addition, elevated concentrations of radionuclides were reported in several historical reports with gross alpha concentrations documented to exceed

maximum concentration limits (MCLs) of 15pCi/l. Unless documentation is provided which justifies the elimination of organic compounds and radionuclides, these parameters must be placed on the COC list. Without a thorough documented understanding of site conditions, the health risks posed by this site will be inaccurately determined and the selection of remedial actions (closure alternatives) may be inappropriate.

This plan proposes an indirect, and moreover, problematic approach for the determination of leachate production, e.g., 4 soil moisture probes across the entire Yerington Mine site. While companion work plans basically characterize only the upper 1 foot of soil of each mine unit and not below this depth where groundwater impacts and problems may exist, establishing the source term for a groundwater problem is not possible with the proposed monitoring well network. Groundwater pathway characterization efforts presented in this plan must be comprehensive for each mine unit. The most direct and efficient technology available for the assessment of groundwater quality is the direct sampling of groundwater via monitoring wells. When taking into consideration the inadequacies of some existing monitoring wells and the deficient distribution of proposed wells, it is evident that the groundwater pathway is not being characterized for the large mine components such as the waste rock areas, oxide tailing pile, process areas, landfills, and leach pads. The monitoring well distribution of existing and proposed wells must be reconsidered in order to achieve the DQOs specified in this plan, particularly for mine units in the middle and southern areas of the site. Moreover, this plan continues to propose a deficient background characterization effort.

As mentioned earlier, some older monitoring wells have inadequate completions and/or documentation and cannot be used for this or any other investigation; moreover, several of these wells should be physically abandoned. All historical/existing wells need to be reviewed for adequate construction, completion intervals, locations, and documentation regarding lithologic descriptions. Without adequate knowledge of these wells, they could provide misleading information and conclusions.

BLM Specific Comments

The following specific comments are intended to direct attention to the major deficiencies within the proposed work plan and need to be addressed with meaningful and significant revisions.

1) The use of surface and subsurface geophysical techniques and groundwater sampling techniques such as hydro-punch needs to be considered and incorporated in this and as well as the other work plans by ARC and its subcontractor. These technologies have been proven to be a useful tool in the investigation of subsurface geologic and hydrogeologic features and in identifying buried wastes and releases to the subsurface and groundwater.

More specifically as an example, these tools can be useful in helping identify strategic locations and the appropriate installation and construction of monitoring and extraction wells. The use of these tools can help eliminate areas of potential concern and can also reduce, and in some cases eliminate, the uncertainty cited in these work plans. Implementation of these tools needs to be proposed in this work plan where appropriate.

2) Page 3, first paragraph, third sentence, and second paragraph, fourth sentence: *The resulting solution was decanted and the remaining solids were placed in the tailing ponds.*

ARC acknowledges the fact that unlined ditches may have been used to transfer this slurry; however ARC doesn't address this concern as a potential source to any of the pathways in any of the companion work plans. Given the current characterization strategies, this is one of the several mine units that will go uncharacterized. Selecting remedial actions for Yerington Mine components is impracticable unless a thorough understanding of the site is obtained during the characterization effort.

Page 3, first paragraph, last sentence: *Residual solutions were conveyed to the evaporation ponds at a rate of 700 gpm.*

According to the "Draft Tailings Areas and Evaporation Ponds Work Plan" (see page 11, section 2.4), this solution was delivered via an unlined ditch. This ditch must also be considered as a mine unit and characterized accordingly because it may have caused potential groundwater degradation and potential ground surface contamination. The location of this ditch must be identified on a figure in the work plan. ARC's response is that the ditch will be evaluated in the "Draft Final Tailings Areas and Evaporation

Ponds Work Plan,” but upon review of this plan no evidence of this is found and the location of this ditch is not presented.

Page 3, last paragraph, second sentence: “*Arimetco constructed and operated an electro-winning plant*”

The electrowinning plant is listed as a mine unit causing potential groundwater degradation (see page 5). However, Figure 2 doesn’t indicate the location of this specific facility. All of the mine units listed on pages 4 and 5 are acknowledged as potentially causing groundwater degradation. All of these units must be shown on the appropriate figures of the work plan.

3) Page 4 and 5: This groundwater plan needs to investigate all mine units, especially the Waste Rock Areas (WRAs) and Oxide Tailings. The WRAs are significant features of the Yerington Mine; moreover, per the historical data record, they contain measurable amounts of heavy metals. At a minimum, an adequate number of groundwater monitoring wells needs to be installed in the WRAs to assess the quality of groundwater and the direction of groundwater flow.

4) Page 5: Additional information regarding the mine units must be provided so that general knowledge of their potential implication to the groundwater pathway can be understood. For example, what activities occurred in the area of the Arimetco electrowinning facility that potentially makes it a groundwater source? What COCs should be of concern? What waste streams were going to the landfill(s)? Why are pesticides and herbicides a potential problem (see table 7)?

Characterization of the groundwater pathway must also consider the potential sources, and the COCs which may have been released by a specific mine unit. Additional information regarding the mine units and the possible COCs must be provided in this section of the work plan. Cross-referencing this information to another companion work plan may be possible, but only if it is actually in the specific work plan that is being cross-referenced.

5) Page 7, last paragraph: A composite lithologic log is provided in this plan. Seitz developed this composite log via combining the logs of USGS-1A and Anaconda well #35. ARC’s response is that the location of these two wells is provided in Figures 7A and 7B, however, the wells identified as USGS-1A, USGS-1B or MW-35 are not presented in these figures. So that a better understanding of the geologic setting can be achieved, this plan and not just the comment responses should properly reference the figure presenting their locations as Figure 8A and Figure 8B.

6) Page 9, first paragraph: As mentioned in the previous comment, presenting the location of these two wells is necessary to better understand the information being discussed. This Plan, and not the comment responses, should acknowledge the name changes of these wells and correctly reference Figure 8A and Figure 8B, the figures that show the locations of wells USGS-1B and MW-35.

7) Pages 11 through 13: It is stated that “*The complexity of the contours and flow paths in the area of the mine shown in Figure 9 may result from the use of groundwater elevation data from wells screened...*” (page 12, second paragraph). The complexity of the contours may also be a result from the use of groundwater wells with apparent problems (see last comments on monitor wells) and more certainly from the lack of monitor wells in the area. Without appropriate data to support the statement, all possibilities need to be considered and evaluated.

8) Page 12, last paragraph: The effectiveness of the pumpback wells is proposed to be investigated in this work plan, but the plan fails to include the methods that will be used to evaluate their effectiveness. How will this be accomplished?

9) Page 14, first paragraph: Can the lower extraction rates be from the result of improper construction of the pumpback wells?

10) Page 14, second paragraph: *"The contours were drawn in Figure 10A..."* As noted in previous comments about the uncertainty of monitor well construction and ARC's acknowledgement of such uncertainty existing, the presentation of data relying on such information must be disclosed in the work plan and a proposal to remedy the uncertainties and deficiencies must be proposed.

11) Page 21, second paragraph: *"Two monitoring wells, W5AB-1 and W5AA-1..."* See comment 10 above and comment on Appendix A. Additional data would most definitely improve the understanding of groundwater conditions at the site, therefore, an appropriate number of new and replacement monitor wells must be proposed in the work plan.

12) Page 24, first paragraph: It appears that historical datasets are the foundation for the selection of the COCs, but the basic rationale for the selection of the COCs must be provided. The COC list, however, is incomplete and ignores obvious facts about the site's history. Foremost is the plan's failure to acknowledge the MCL for gross alpha (15 pCi/l), which based upon historical data, is exceeded. Historical reports from ARC's contractor (AHA) and the USGS show concentrations of gross alpha commonly exceeding over 400 pCi/l. Other radionuclides would most likely exceed their MCLs. This plan and other work plans must incorporate the analysis of radionuclides into their COC list. An essential element in assessing risk and selecting remedial actions (closure alternatives) is thoroughly characterizing site conditions. This plan must be revised to properly address the selection of the all COCs.

A table of groundwater parameters is provided on page 60 of this Plan. As commented earlier, no justification for why these parameters were selected has been provided. Other companion work plans acknowledge transformers containing PCBs, and drums/containers containing flammable liquids currently exist on-site. Furthermore, these companion work plans acknowledge the existence of over 7 acres of concrete pads and building foundations for which there is no record of their mining related purpose. A mine site of this size would need its own on-site mechanical repair shop and fuel depot. ARC or its contractors have never published results of any organic contaminants in the groundwater, but there is no proof that these have ever been previously investigated. Until proper documentation has been provided, which justifies their removal, certain organics must remain on the COC list. Revision of the COC list after this proposed plan only delays the assessment of risk. There is no justification for this delay (see comments for page 54 and Table 7).

13) Page 24, third paragraph: Defining the areal extent of groundwater contamination is impossible without a defensible background characterization effort. None of the conclusions presented in this plan are defensible until background has been properly defined. This plan must incorporate a defensible background groundwater characterization effort, or a stand-alone background characterization plan should be developed for all media at the Yerington Mine.

14) Page 25: None of the conclusions presented on this page can be made until a defensible background characterization has been determined and the hydrostratigraphic units defined so the connection to the subdivision is known. However, another interpretation of the results is that based upon the 1954 aerial photo of the Yerington Mine (C1) in Appendix C in the Draft Final Tailings Areas and Evaporation Ponds Work Plan, February 14, 2003, the elevated TDS, sulfate and arsenic concentrations may very well be associated with the "Discharge Location," as depicted in C1.

15) Page 27, Data Quality Objectives: The DQO process cited in the plan is inadequate to address the process areas. The "Guidance for the Data Quality Objectives Process" (EPA QA/G4, August 2000) must be used in this and other work plans to develop appropriate and relevant DQOs. If this process is not used, or is modified without supporting rationale, this Plan will not meet its intent.

The problem statement (Step 1) is incomplete because it does not address potential source areas that may be contributing to groundwater impacts and resulting in risks to human health and the environment.

The question asked in Step 2 of the DQO process is also incomplete because it does not address the potential source areas that may be contributing to groundwater impacts. For example, how can groundwater monitoring support the development and the evaluation of remedial actions (closure activities) without also including the remedial investigation of potential source areas? Other draft work plans do not address potential source areas and cannot be relied upon.

16) Page 28: The Constituents of Concern (COCs) are being proposed in the DQO discussions without providing any documentation that justifies why the COC list is limited to inorganics and while PCBs, fuels, degreaser solvents and radionuclides are ignored. Again, based upon past sampling by Sietz et al. and AHA, specific radionuclides are detectable at this site and some are above approved drinking water standards, particularly gross alpha with an MCL of 15 pCi/l. Analysis for radionuclides must be included so that an adequate risk assessment can be documented. Eliminating parameters such as radionuclides, DROs and GROs from the list of COCs the documentation/evidence must be provided. Specifically, isotopes of uranium, radium, thorium, gross alpha, and associated daughter products must be added to the COC list. Moreover, the methods used for their analyses must be consistent with applicable health standards so the results and standards are in like-units of measurement. This Plan proposes revision of the COC list after the investigation of the Process Area (see Table 7) this only delays the assessment of risk and closure of this site. There is no justification for this delay. Also see comments for page 54 and table 7.

A table presenting the list of groundwater parameters is provided on page 59, no justification for why these parameters have been selected as the COCs has been provided in this work plan. Other Yerington Mine companion work plans acknowledge the presents of transformers containing PCBs, and drums/containers containing flammable liquids are currently present on site. Furthermore, these other work plans acknowledge the existence of over 7 acres of concrete pads for which there is no record of their mining related purpose. A mine site of this size would need its own mechanical repair shop and fueling depot. How does ARC know that there isn't any organic contaminant in the groundwater, and where has this been previously documented? Because on-site fuel depots and machine shops existed, their location and downgradient locations should be monitored for fuel spills/leaks and solvents. Revision of the COC list after this effort delays the assessment of risk and closure of this site. There is no justification for this delay.

17) Page 28. First Bullet: This DQO addresses the adequacy of the data to determine the “COCs that may be sourced from surface mine units in the future”

See previous comments regarding the development of the COC list. This Plan doesn't utilize all applicable information regarding the potential sources and their respective contaminant of concern, e.g., gross alpha results exceeding MCL, unknown building foundations, fuel depots etc. The COC list must be revised.

The “adequacy” of the data must first be based upon the quality of the data. This encompasses not only its analytical quality, but also the quality of the well completion and construction. As presented in Appendix A of this Plan, the construction of many older wells is inadequate, and therefore, the information obtained from analytical results from these wells is questionable. For example, well WW-10 has a perforated casing from 105 feet to 505 feet and crosses both the shallow alluvial aquifer and the bedrock aquifers. Water quality results from this well represent a mixture of two types of water and are not comparable to wells isolated in a single aquifer. The completions/construction of these older wells should be reviewed and those with screened intervals crossing two or more known aquifers, or lack adequate documentation should be abandoned. This Plan states nothing about well abandonment. Many of the older wells have “sawed” slots, which are not an accepted practice for regulatory monitoring. See additional comments on page 53 regarding the use of downhole video cameras for the evaluation of existing wells.

The DQOs of companion work plans for the Yerington Mine specify that risk to down gradient receptors will be assessed, yet they propose to only characterize the upper portions (1 foot) of the ground's surface.

This groundwater work plan proposes the installation of four soil moisture monitoring locations across the entire site. Many of the mine units listed on pages 4 and 5 are not specifically characterized for their role in Yerington's groundwater issues. The various work plans for the Yerington Mine need to be better coordinated to effectively cover the DQOs being presented in all the Yerington Plans. Additional wells are necessary upgradient of the mine and in the middle and southern portions of the site, e.g., process area, waste rock areas, leach pad area etc. This Plan needs to be revised so an adequate characterization can support the risk assessment and selection of closure alternatives.

18) Page 29, second bullet and page 51, first bullet: A single background well (MW-A) is proposed to be installed in the alluvial fan near Weed Heights, however, the current monitoring well network encompasses wells completed in bedrock, lacustrine and flood plain deposits. The current Plan assumes waiting an additional year to determine if other wells, currently in the monitoring network, can be considered background, but fails to consider the ramifications if others monitoring wells are not acceptable as background. The geochemical composition of groundwater is directly associated with the type of sediment/lithology through which it flows, a basic principle of groundwater quality. To properly assess background, background wells need to be completed in similar hydrostratigraphic units that are being monitored for potential contamination. Adequate comparisons of these down-gradient wells, cannot be defensibly compared to a single background well of a different lithology. Further details of background should be provided in this work plan, such as will the four quarters of background be "pooled" together and statistically compared to the downgradient monitoring wells? The current work plan suggests it can potentially pool the results from any well to produce a "background" definition. There is no assurance that the definition of background cannot be biased when using one true-background well. Will seasonality be removed? Seasonality isn't always apparent in four samples. How will spatial variability be addressed? The Yerington Site is composed of many large features that potentially impact groundwater quality, but each in a different manner and different geologic setting. Defensible information regarding background groundwater strategies should be provided in this work plan. The proposed effort for the characterization of background conditions should be expanded with additional wells with specific completions in the various deposits found downgradient. There is no reason to sacrifice the statistical power of the background dataset to "wait and see" if additional wells may be sufficient, particularly when the procedure of background determination is not defensible. Review of the current data suggests the proposed "wait and see" background wells are not sufficient to be considered as background wells.

19) Page 29, last paragraph: The Spur is "hypothesized" to impede recharge from the Walker River, but the same paragraph admits that the bedrock doesn't impede flow near the Pit. The basis for this hypothesis is questionable, so additional monitor wells will be necessary to validate or invalidate this hypothesis. Furthermore, no wells exist nor are any proposed to be installed in the WRAs. The WRAs are a potential source of contamination to groundwater. This Plan should be revised. Also see the comments for page 52 regarding the DQOs.

20) Page 30, last paragraph and sentence: The proposed monitoring schedule of quarterly for one year is unsupported and not acceptable.

21) Page 33, third paragraph: *"Groundwater flow conditions in the Spur are poorly known" and "However, if the hydrologic character of bedrock will likely be controlled by fractures and boundary conditions resulting from faults and lithologic contacts."*

With so much uncertainty of the conceptual model, additional wells should be proposed which will specifically answer this question. Currently wells are not being proposed in this area. In addition, the last sentence of this paragraph also suggests, "*water bearing structural zones*" for dewatering and "*fracture zones*" for recharge. If these aspects of the hydrologic system are important, wells should be proposed to quantify these issues because it is critical information for understanding the hydrogeologic system. On page 52 of this plan (last sentence), additional wells are suppose to be installed for hypothesis testing related to the site conceptual hydrogeologic model, however, none are proposed for this purpose. This Plan should be revised to incorporate additional wells capable of defining the hydrogeologic system and assist in the water balance of the site.

22) Page 34, second paragraph: Similar to the previous comment, this paragraph discusses how bedrock “likely” impedes flow; however, these same features have been stated to be important to the dewatering and recharging of the pit. Additional wells are necessary to eliminate ARC’s uncertainty.

23) Page 38, Post-Mining Groundwater Conditions: ARC has presented hypotheses to explain post-mining groundwater conditions; however, investigations have not been presented or proposed to test the hypothesis. Without the appropriate investigations that test each hypothesis the hypothesis cannot be accepted or used to draw conclusions that lead in a direction away from remedial investigations.

24) Page 38, first bullet: Without providing the appropriate information, supporting rationale, and proposed test of this hypothesis it is not reasonable to assume that the Yerington Pit Lake is like most other pit lakes and will likely function as a sink.

25) Page 38, second bullet: Again, without providing the appropriate information, supporting rationale and proposed test of this hypothesis, it is not reasonable to assume that the pump-back wells are functioning as efficiently as described. In fact, well construction information suggests that the pump-back wells are not constructed properly nor have they pumped the expected volumes that were originally predicted.

26) Page 38, third and fourth bullets: Again, without providing the appropriate information, supporting rationale and proposed test of this hypothesis, it is not reasonable to assume that the inactive process components have sufficiently dried to create excess moisture storage capacity. Also, it is not acceptable to predetermine that these components are now “less likely or no longer able to source leachate to groundwater” without proposing to appropriately test (evaluate) this hypothesis. Although a statement is made that this will be evaluated in this and other work plans, agency comments on those and this work plan clearly indicate that the proposed evaluations do little in the way of remedial investigation of these components.

To assist in showing the coordination of the various Yerington Plans, the companion work plans should be specified by name.

27) Page 39: The large cone of depression for the pit may also have drawn contaminants downward into the bedrock.

28) Page 40 through 50, Conceptual Site Groundwater Budget: Many assumptions and hypotheses are made throughout this section, but no work (tests) is proposed to verify whether they are correct or not.

Section 3.0 Work Plan:

The following comments cross reference to Table 6, which presents the rationale for each proposed monitoring well, piezometer, surface water sampling point, and soil moisture monitoring stations.

29) Page 51, first bullet: *“Additional assessment of ambient or background groundwater quality.”*

Assessment of background conditions should first consider the site conceptual model. For this site, such a model is complex, and this work plan states the model’s uncertainties in understanding groundwater flow due to the unknown relationships of structural boundaries, sediment facies, fracture zones, recharge zones etc. Groundwater quality is partially controlled by the lithologic makeup of the aquifers and residence time of the ground water. As discussed in this work plan, four basic aquifer units exist and are composed of alluvial fans, mineralized bedrock, lacustrine deposits and fluvial deposits. Similarities and differences in groundwater quality must be documented before the number and location of background wells can be proposed. Based upon current groundwater data too few wells can be used for defining background conditions. The basic principles of defining background condition are lacking in this work plan. This work plan needs to be revised so it follows basic principles of a groundwater characterization

and so that it can support an accurate risk assessment and selection of remedial actions (closure alternatives).

Based upon the information provided in this Plan, the proposed well MW-A is the only background well in this study and because it is completed in an alluvial fan near the recharge zone, its water quality will differ from those in the bedrock, and likely that of the lacustrine and fluvial deposits. The accuracy of future management decisions will be based upon the completeness of defining background conditions. This work plan must provide a detailed and defensible approach for defining background groundwater conditions.

30) Page 51, second bullet: *“Improved definition of groundwater flow directions in the area of the mine site.”*

Groundwater monitoring wells are not proposed for several significant mine units (e.g., WRAs and oxide tailings); these units cover large portions of the Yerington Mine. Understanding groundwater flow directions and groundwater quality beneath these units is necessary before risk can be properly assessed or selection of remedial actions (closure alternatives) is possible.

As previously stated, the integrity and adequacy of some older wells are questionable, and several wells should be physically abandoned and some not considered for further investigations at the mine. Several of these wells are located in the heart of the mine site where fewer wells exist (e.g., WW-10 and WW-59). Replacement wells are necessary for these older wells. Per the DQOs of this work plan and those of companion plans, the potential impacts to groundwater by the mine units are to be investigated. With so few adequate wells, the current well distribution within the middle and southern portions of the site will fail to fulfill the DQOs. This work plan must propose additional wells so an adequate understanding of the site can be supplied to the risk assessment and the selection of remedial actions (closure alternatives).

31) Page 51, fourth bullet: *“Evaluation of any current contribution of constituents of potential concern by surface mine units.”*

The distribution of wells (over 2,000 feet apart) in the middle and southern portions of the mine site is too sparse to confidently evaluate the groundwater conditions in these areas and adequately comply with the DQOs of this work plan and the companion plans. For example, the Process Area has one existing well and no new wells are being proposed, the WRAs have no existing wells and none are being proposed, and the various leach pads have three wells with no new wells being proposed. Based upon companion work plans, significant mineral content is present in the WRAs, so they could also be a source for groundwater contamination. Therefore, the proposed characterization strategies for these mine components cannot possibly evaluate the COCs with any certainty. As stated in the previous comments, this work plan must be revised so that it is comprehensive in its attempt to characterize the Yerington Mine.

32) Page 51, sixth bullet: *“Evaluation of recharge and discharge components to the alluvial groundwater flow system beneath the mine site.”*

Without the installation of additional monitor wells this objective cannot be achieved (see previous comments).

33) Page 51, seventh bullet: Without determining which potential mine source areas are impacting groundwater, it's impossible to establish “closure plan” options for groundwater. Unless ARC is prepared to install and perpetually maintain a more efficient and elaborate pumpback systems at the site, then ARC should vigorously characterize which mine source areas are impacting groundwater.

34) Page 51, Section 3.1 first bullet and Page 53 first paragraph and Appendix A: This work plan needs to provide the criteria for the evaluation process of the existing wells. The work plan doesn't define

what an “adequate” well completion is; however, based on the review of submitted well logs, many of the existing monitor wells are inadequate.

35) Page 51, second bullet: The drilling of additional wells must also include the replacement of inadequate existing monitor wells (see comments on Appendix A below).

36) Page 51 fourth bullet and page 52 first bullet: See comment for page 30.

37) Page 52, third bullet: The criteria of how the depth selection of the probes will be determined are not provided. Moreover, this method is better used for designing of landfill covers/caps than to assess impacts to groundwater. Methods that are sure to assess impacts to ground water are direct sampling of the groundwater and MWMP testing of potential source materials. This type of sampling and analysis would eliminate the inherent assumptions of vadose monitoring/modeling. Relying on assumptions and vadose modeling is problematic and often inaccurate. See comments for page 54.

38) Page 52, last sentence and Table 6: Additional wells are necessary to answer all the hypotheses and uncertainties mentioned in the conceptual model. Review of Table 6 (Proposed Monitoring Sites) highlights the mistake that several mine units listed on pages 4 and 5 are not being monitored for their potential groundwater impact. Risk assessments and selection of remedial actions (closure alternatives) are impossible if site conditions remain unknown.

39) Page 53, Existing Monitor Well Evaluation: *“Selected wells currently used...will be evaluated for continued use”*

The criteria for “selecting” these wells are not provided in sufficient detail to understand the exact nature of this evaluation. Moreover, defining “adequate for monitoring” must be provided in this section. Using a video camera survey in determining well screen intervals and well condition doesn’t and cannot determine whether the well is suitable because the survey cannot determine whether wells were properly constructed and the wells screens placed correctly across the aquifer. See previous comments for page 51 above.

40) Page 53, Monitor Well and Piezometer Drilling: The proposed monitor well locations will fail to evaluate potential source areas (see comments 4, 5, 14, and especially 19).

41) Page 54, Groundwater Elevation Measurements, Groundwater Sampling and Analyses: See comments for page 30.

42) Page 54, Groundwater Quality Sampling and Analyses and Table 7: The rationale for the selection of the Constituents of Concern (COCs) should be presented in this Plan. Because of the known presence of on-site radionuclides (per historical data), unknown mining processes, PCBs, solvents, flammable liquid containers and the likelihood of machine repair shops and fuel depots the COC list should be expanded to include these parameters. As previously commented, linking each mine unit’s activity to a potential COC reveals the rationale for the development of the COC list. Table 7 of this Plan states the sampling and analysis of PCBs, SVOC, TPH, and VOCs, chlorinate herbicides and organochlorinated pesticides are “pending process areas site investigation”. COC tables of the Process Components work plan do not indicate these parameters are being investigated as part of that effort. Both of these work plans must be better coordinated. COCs of this Plan and that of the Process Area need to be expanded to include VOCs, PCBs, fuel indicators such as diesel range organics (DRO), Gasoline Range Organics (GRO), Total Petroleum Hydrocarbon (TPH), and isotopes for uranium, thorium, radium, and associated daughter products. All of these additional parameters need to be analyzed with methods that provide the result in the same unit of measurement as the applicable health standard.

What is the justification for sampling and analyzing for pesticides and herbicides? What mine unit(s) are these associated with?

Comments on Appendix A

Appendix A presents many well logs. Because the quality of some of these wells is questionable, their ability to provide accurate information from which risk and/or closure alternatives should be based is a concern. When cross referencing the logs presented in Appendix-A to the wells shown on Figure 19 (the proposed well locations) many of the Appendix-A wells are missing from Figure 19. The opposite also exists. See the following lists:

Logs provided, but Location not shown in Figure 19:

W5AA-2, W5AB-1, W5DB, W4CB-1, Well #26, Well #22, Old Well #29, Old Well #35, New Well #35, and Well □12C.

Location indicated in Figure 19 is provided, but Log is not provided in Appendix A:

MW-3, USGS-13, W32DC, MW-2002-1, W5BB, MW-2002-2, PWELL-4, WW-36, D5AC-1, PW-05, PW-04, and PW-01

A review of the Appendix A logs revealed the following problems:

Incomplete Records

W4CB-1; one record shows total depth (TD) is 240 feet, but only shows lithology descriptions to 90 ft and a second page showing drill logs beyond 90 feet is not provided. Another well with same ID number (W4CB-1) is provided which has only a 91 feet TD. Where is the log from 91 feet to 240 feet?

W5DB; the second page is not provided.

WW-10; over-generalized lithology log.

Well#59 is assumed to be WW-59, but confirmation is needed. Also has an over generalized lithology log.

WW-1; no lithology log is provided.

WW-2; no lithology log is provided.

Well #22; over generalized lithology log.

Illegible Records

Screen intervals for wells MW-1, and MW-5 were highlighted which hindered the reproduction/coping of these logs.

Construction Errors

Excessive Screen Length: W5DB (30 feet), WW-10 (400 feet) and crosses aquifers, WW-59 (390 feet), Well #26 (272 feet) and crosses aquifers, Well #22 (337 feet), Old Well #29 (250 feet), Old Well #35 (387 feet), New Well #35 (100 feet), Well-12c (255 feet),

Sawed Perforation: MW-1, MW-2, MW-4,

Excessive gravel pack: MW-1, MW-2, MW-4, New Well #35,

Unusual Construction: W5AA-1, W5AB-1, W5DB; a second blank casing interval exists below the well screen. This second interval must be recognized so sufficient amounts of groundwater are purged prior to sampling.

Accordingly, Atlantic Richfield has indicated that you would like to have a meeting with the Agencies to discuss these comments and to facilitate a successful final document. Please contact this office not later than November 12, 2003 to discuss acceptable meeting dates. The final document will be due within 30 days of the scheduled meeting as per the approved submittal schedule.

Should you have any questions or if I can be of any assistance, please do not hesitate to contact me at (775) 687-9376 or FAX (775) 687-6396. All future correspondence regarding this subject should be addressed to the undersigned.

Sincerely,



Arthur G. Gravenstein, P.E.
Staff Engineer
Remediation Branch
Bureau of Corrective Action

ec: Ms. Jennifer Carr, NDEP

Cc: Mr. Joe Sawyer, Project Manager, SRK Consulting, 102 Birch Drive, Yerington NV. 89403
Mr. Dave McCarthy, Atlantic Richfield Company, 307 E Park Ave., Anaconda, Montana 59711
Mr. Chuck Zimmerman, Senior Associate, Brown and Caldwell, 3488 Goni Road, Suite 142, Carson City, NV 89706
Mr. Chuck Pope, Deputy Assistant Field Manager, Bureau of Land Management, Carson City Field Office, 5665 Morgan Mill Road, Carson City, NV 89701
Ms. Molly Mayo, Senior Mediator, Meridian Institute, P.O. Box 1829 Dillon, CO 80435
Mr. Elwood Emm, Chairman, Yerington Paiute Tribe, 607 W. Bridge St., Yerington, NV 89447
Ms. Veronica Guzman, Chairwoman, Walker River Paiute Tribe, P.O. Box 220, Schurz, NV 89427
Mr. Tad Williams, Environmental Director, Walker River Paiute Tribe, P.O. Box 220, Schurz, NV 89427
Mr. Stanley Wiemeyer, U.S. Department of Interior, Fish and Wildlife Service, 1340 Financial Blvd, Suite 234, Reno, NV 89502-7147
Mr. John Krause, Environmental Coordinator, Bureau of Indian Affairs, Phoenix Area Office, P.O. Box 10, Phoenix, AZ 85001
Mr. Jim Sickles, Project Manager, U.S. Environmental Protection Agency, Region IX, 75 Hawthorne Street, San Francisco, CA 94105
Ms. Phyllis Hunewill, Commissioner, Lyon County, 31 South Main Street, Yerington, NV 89447
Mr. Steve Snyder, County Manager, Lyon County, 31 South Main Street, Yerington, NV 89447
Mr. Dan Newell, Manager, City of Yerington, 102 South Main Street, Yerington, NV
Mr. Bob McQuivey, Habitat Bureau Chief, Nevada Division of Wildlife, 1100 Valley Road, Reno, NV 89520
Ms. Libby Levy, 75 Hawthorne Street, San Francisco, CA 94105
Ken Paulsen, Behre Dolbear & Company, Inc., PO Box 1930, Arvada CO 80001
Mr. Ken Spooner, Manger, Walker River Irrigation District, P.O. Box 820, Yerington, NV 89447